infants and young children, and are often multiple. They are subacute and a fatal termination is rare.

f. The various conditions enumerated above have a tendency to spontaneous recovery by suppuration, extrusion of sequestra, and ankylosis of joints.

g. As treatment, incision and drainage, with removal of sequestra, is usually sufficient. But in cases of arthritis, prolonged suppuration and ankylosis may be avoided by arthrectomy or partial resection of the joint.

MISSION HOSPITAL, KASHMIR, INDIA,
July 4, 1890.

SURGICAL AND MECHANICAL TREATMENT OF THE DEFORMITIES FOLLOWING INFANTILE SPINAL PARALYSIS.[1]

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The pathology of infantile spinal paralysis, or anterior polio-myelitis, is not considered in this article, since the object of the paper is to deal only with the severer grades of resultant deformities.

These deformities are produced by muscular atrophy, degeneration, and contracture, together with want of bone-growth, and the distortions which result from locomotion. The deformities are frequently so great that the individual spends his life upon the floor and the members become so misshapen that they are mechanically unsuited for locomotion even could muscular power be restored. This paper is intended to deal almost exclusively with this class of cases—the ones ordinarily considered hopeless cripples.

Locomotion, however, even in these cases, is often possible by the proper application of surgical means together with the skilful use of mechanical appliances, thereby greatly augmenting the usefulness, the health and the happiness of the individual.

The limbs must first be brought into such position that they will assist in sustaining the weight of the body, or be incorporated as a part of the apparatus to sustain such weight, either with or without crutches.

Surgical measures offer the most rapid and efficient hopes for relief. To attempt to rectify these members by mechanical means alone is to inflict an unwarrantable amount of pain, time, and expense without accomplishing any better results than can be secured by vigorous measures. Section of the tendons and muscles will necessarily be performed upon the strongest group, and they are thus placed at a slight disadvantage, thus tending to restore the equilibrium of the muscular action of the limb.

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[1] Abstract of a paper read at the Tenth International Congress, Berlin, 1890.

Surgical treatment may be classed under the following heads:

I. Tenotomy.
II. Myotomy.
III. Division of the contracted fasciæ and other tissues.
IV. Force.
V. Resection.
VI. Osteotomy.
VII. Amputation.

I.–IV. The first four procedures are frequently combined as one operation. The best rule to be followed is that the shortened tissues must be relieved by section and by force sufficient in amount to permit rectification of the member or to place the limb in a position for locomotion.

At the hip, the deformity being in the direction of flexion, myotomy of the origin of the tensor vaginæ femoris, the sartorius and long head of the rectus, together with the fascia, is frequently necessitated. Rarely the psoas iliacus or the external or internal rotators or the adductors will require division. In this latter case open division is the only safe method. The femoral artery and anterior crural nerve must be carefully avoided. Otherwise section can be freely performed, but whether done subcutaneously or by open incision, thorough antiseptic precautions must be rigidly enforced. Force must be employed to the extent consistent with the integrity of the bone. Extension by weight and pulley must subsequently be applied for many weeks. This continued extension will also greatly benefit the frequently accompanying condition of lordosis.

At the knee, section of the tendons of the biceps or of the semi-membranosus and semi-tendinosus is frequently necessary. If dense bands of contracted fascia remain in the region of the popliteal space open incision will be the wiser procedure.

Horizontal extension by weight and pulley and constant pressure upon the knee by means of splints or weights will add to the subsequent benefits to be obtained by operation.

When great deformity of the condyles is present, as is so frequently the case, resection offers the best hope of restoration. The condition of hyper-extension or of genu-recurvatum or back-knee does not permit of surgical relief except by resection.

Section at the ankle and foot will vary according to the condition of the deformity. In extreme equino-varus, division of the tibialis anticus, posticus, fasciæ and ligaments is frequently required in addition to the tendo Achillis; in fact every contracted tissue which resists rectification must be divided either openly or subcutaneously. The former is the preferable plan, since it heals more rapidly and does not leave a resultant deep sulcus.

When the deformity of the foot is in the direction of valgus, section of the peroneals and forcible rectification of the foot with fixation for a number of weeks in a condition of artificial varus will prove valuable if followed by the use of the proper apparatus.

In calcaneus, shortening of the tendo Achillis is sometimes desirable.

Force to an extreme degree may be required in old cases, and if employed by the surgeon's hands over sand-bags and hard pads need never result in sloughing. Torn ligaments, or even fractures of the bones, if subcutaneously performed, will rapidly heal. Excision of one or more bones will sometimes be required in adult cases.

V. Resection is sometimes desirable at the knee when there is great bone-distortion and the operative procedures already enumerated have been insufficient. Resection is also sometimes desirable in flail limbs in order to secure a stiff walking member; also sometimes in back-knee, in-knee, and out-knee.

At the ankle and foot, tarsectomy is also occasionally necessary in extreme cases. Removal of the astragalus is the simplest and most effective measure. The other bones may sometimes require excision. Powerfully and intelligently applied force with the divisions already described usually takes the place of any form of excision of the tarsus.

VI. and VII. Osteotomy and amputation are procedures which will occasionally become necessary.

Mechanical treatment after operation.—A good position can often be secured by horizontal extension with weight and pulley; by the application of splints or plaster-of-Paris dressings, or by other methods of rectification while the patient remains in bed.

For locomotion some mechanical appliance usually becomes necessary. The principles of these appliances only can here be described. All apparatus should be as light as possible; it should be so arranged that the circulation is free and unmolested, and muscular action should be favored rather than hindered. Every muscle should be compelled to do its full work in the support of the body, since by walking, running, playing, etc. (the most valuable of gymnastic exercises) will the muscle cells be developed. Elastic force should be freely employed, since by such assistance the peroneals, the tibials, the quadriceps, the extensor femoris, or any other muscle, can have its force augmented and yet be itself brought into active use. Pads, straps, stop-joints, rarely locked-joints, etc., are all to be applied as needed.

A flattened valgic arch of the foot should be supported by accurately-fitting steel springs and by elevating the sole of the shoe upon the inner side. The in-knee and out-knee, etc., should be properly supported by pads. An apparatus may be only necessary for the ankle, or the appliance may need to extend almost to the axillæ. In helpless cases, where the entire lower portion of the body is paralyzed, the apparatus must extend to the thorax to support the weight of the body while the body is swung forward upon crutches. In these cases locking and unlocking joints at the hips and at the knee are essential, as the support must be rigid during walking, but flexion is necessary in the sitting posture. The advantages of locomotion in the open air, even with such an extensive apparatus and on crutches, can only be appreciated by one who has been compelled to spend his life upon the floor or upon a bed.

The following are specimen cases selected from my note-books showing the gain that can be accomplished. The illustrations are all taken from photographs.

CASE I.—Female, aged twelve years; infantile paralysis in infancy. Has never walked; only slides along the floor. Totally unable to stand, even with the help of a chair. Flexion at the hips and knees. Sub-luxation of both knees. The feet are only slightly deformed, as the weight of the body has never been borne upon them.

FIG. 1.

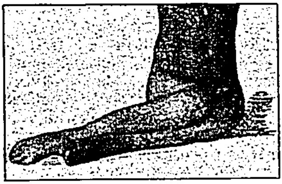


FIG. 2.

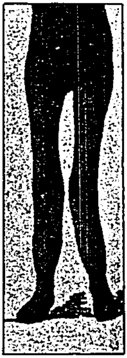
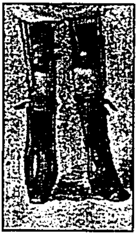


FIG. 3.



Subcutaneous section of the tensor vaginæ femoris, rectus, sartorius, and hamstring tendons, with strong subsequent force, and horizontal extension with weight and pulley. In eight weeks, apparatus extending from the perineum to the feet. Walked first with crutches, then with canes. After one year walked without either, even on rough pavements. Legs developing.

CASE II.—Boy, aged fourteen; infantile paralysis in infancy. At eleven years of age had never walked; dragged himself along the floor. Legs greatly twisted. Flexion at right-angles at the hips and knees. Equino-varus left foot; equino-valgus right foot. Hopeless cripple.

FIG. 4.

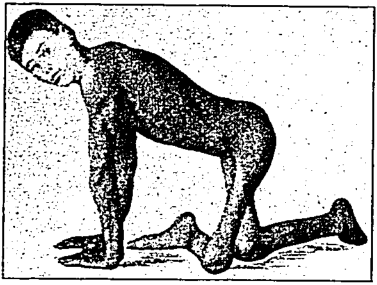
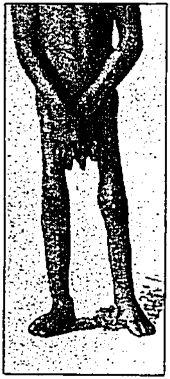


FIG. 5.



Subcutaneous section at the hips, knees, and feet. Fixation by plaster-of-Paris and extension. In two months he walked with crutches with the assistance of an apparatus with elastic straps over the quadriceps femoris, peroneals, and weakened muscles. The valgic foot supported beneath the sole with an arched plate. In six months he was walking long distances, and in one year ran speedily with crutches. Three years later he uses crutches only for long walks, and a cane only for ordinary progression. His limbs are developing and he is capable of earning his own living.

CASE III.—Girl, aged ten; infantile paralysis at three years of age. Absolutely helpless. Discharged from several hospitals condemned to perpetual cripplehood. Limbs perfectly helpless and flail-like. Marked distortion. Extreme lordosis.

Operation; thorough section of all the contracted tissues at hips, knees, and feet; forcible extension and fixation and subsequent pulley extension for nine weeks. Flexion and lordosis greatly improved. An apparatus was manufactured practically constituting the lower half of the body, thus making a support to sustain the weight of the body while it was being thrown forward on crutches. The apparatus extended from the thorax to the feet and rigidly encased the body and limbs, which were a part of the apparatus. There were locking and unlocking joints at the hips and knees.

In one month after, she was able to walk a square upon crutches.

FIG. 7.

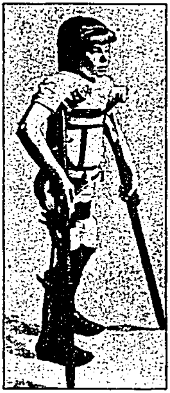
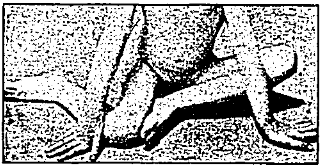
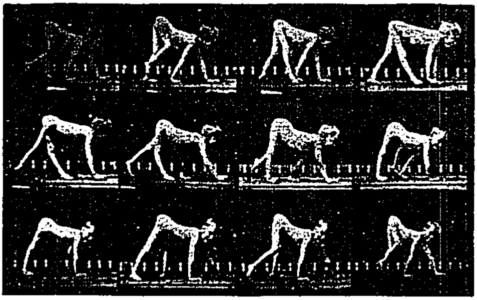


FIG. 6.



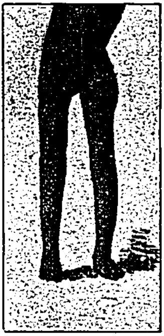
CASE IV.—Girl, aged eleven; infantile paralysis from childhood. Totally unable to support the body in an erect position, but could drag herself along the floor. She could walk in the quadrupedal position, as shown in the photograph, with an awkward, difficult gait. The right foot was in a condition of equino-varus and the left that of valgus. There was great distortion of the left hip, not only in the direction of flexion, but also twisting of the femoral neck simulating dislocation. Through the kindness of Dr. J. Hendrie Lloyd, Attending Physician to the Home of the Merciful Saviour for Crippled Children (in which

FIG. 8.



institution I have operated on a number of these cases), I have been able to secure the accompanying photographs illustrative of her locomotion. This series is one of the many admirable advances made by Mr. Edward Muybridge in photographing animals when in motion. By a series of electrical appliances attached to a number of cameras the various stages of progression are secured throughout the action of the limb from the time it is placed upon the floor, through each of the successive acts of raising, carrying forward, and lowering, until the floor is again reached. The advance of locomotion is depicted from left to right.

FIG. 9.



Operation as before, and apparatus applied. Distortion of pelvis and hip irremediable. The limbs are still unable to maintain the weight of the body, but with a little support from the hands she can stand alone. She progresses very comfortably with a cane or with crutches and apparatus.

CASE V.—Girl, aged thirteen; infantile spinal paralysis from infancy. Very helpless. Deformities and operation as before. Apparatus applied. At first used crutches, afterward cane. With apparatus can walk with a fair degree of speed. Slow progression even without apparatus.

CASE VI.—Girl, aged thirteen. Flexion at hips and knees; not so marked as in preceding cases. Extreme valgus of right foot. Still obliged to use one crutch, as the right limb is unable to bear the weight of the body, but could do so if apparatus at hip and knee were made rigid. Without apparatus the right limb hangs almost helpless.

CASE VII.—Boy, aged ten. Similar history. Operation two years since. Now walks without cane or crutch, but usually uses cane. Cannot walk at all without apparatus.

Since writing this paper a number of cases (some of them accompanied by great distortions, even of the spinal column) have been operated on. The results have been most satisfactory.

CONCLUSIONS.—1. Even the severe resultant deformities of infantile paralysis are capable of being benefited by the skilful employment of surgical measures and mechanical appliances. No case with fairly strong upper extremities should remain in helpless cripplehood, since even crutch locomotion is far preferable to a life upon the floor or upon the bed.

2. The deformities following infantile paralysis can be largely prevented by the early use of some form of apparatus.

3. Surgical measures in long-standing cases should usually precede mechanical appliances, since pain and time are thereby saved, and the

resulting limbs are in nowise inferior to those obtained by the slower processes of mechanical rectification.

4. The surgical measures to be employed are tenotomy, myotomy, division of the fascia, application of force and resection. Osteotomy and amputation are sometimes necessary.

5. Mechanical appliances should be used to retain the limb in proper position, but they should not interfere with the circulation of the member. Crooked limbs can often be straightened so as to be made a part of the apparatus, and the muscles of these limbs should be compelled to do their full extent of work in supporting the body. The apparatus must frequently be made to support a large portion of the weight of the body, the helpless, flail-like limbs being accessories.

6. No case should be abandoned without the most careful and repeated attempts at rectification, as even feeble locomotion will in time become greatly improved by exercise in walking, and the health and happiness of the individual will thereby be greatly increased.

1818 CHESTNUT STREET, PHILADELPHIA.

THE TREATMENT OF CHRONIC PURULENT OTITIS MEDIA BY EXCISION OF THE CARIOUS OSSICLES AND REMOVAL OF OBSTRUCTIONS IN THE TYMPANIC ATTIC,

WITH A REPORT OF THREE CASES.[1]

BY CHRISTOPHER J. COLLES, M.D.,
OF NEW YORK.

IN the present era of surgical advance and discovery, when operations entailing the removal of larger or smaller portions of the diseased economy are so freely and successfully undertaken, it might strike one as strange that one organ should be deprived of the gratifying results of such radical treatment. We remove without hesitation the cataract lens, resect diseased joints, snare off hypertrophied turbinate bodies, etc., and yet otologists, with but few exceptions, have been reluctant to remove from the middle ear portions of a diseased sound-transmitting mechanism, when the latter has lost, by long-continued destructive suppuration, all of its normal functions. They have contented themselves, up to the present time, with palliative methods of treatment, such as the insufflations of powders, the instillations of acids, caustics, with syringing, douching and the like. Everyone who has had much ex-

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[1] Read before the Hospital Graduates' Club of New York.